MAIN-SOFT: Maintaining Software Systems in an Evolving Network of Open Source Providers

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**Inner Ring:** Acando, Husbanken, Nokia/Qt, Telenor, Friprog

**Outer Ring with six foreign universities:** University of Skövde - Sweden, Politecnico di Torino - Italy, Universitat Politècnica de Catalunya - Spain, UFBA in Bahia – Brazil, COPPE/UFRJ in Rio de Janeiro – Brazil, Fraunhofer Center - University of Maryland - US

**Appendix 2:** Commitment letters.
**Appendix 3:** CVs of Conradi, Cruzes, Schiefloe, Osmundsen, Søyland
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1. Relevance

VERDIKT relevance of MAIN-SOFT:

ICT is by the Government’s rolling 5-year Plan for Research\(^1\) identified as one of nine prioritized technology areas, hence the VERDIKT research programme which has five main goals\(^2\):

A Provide and apply ICT technology and knowledge for innovation and ICT-based collaboration - covered by MAIN-SOFT’s focus on cooperative social networks to maintain software.

B Strengthen basic and interdisciplinary competence development in ICT on areas with special importance for future economic and societal development – covered by MAIN-SOFT’s plans for developing a new understanding of evolving networks of software providers, done in a joint venture between software engineering and the social/organizational sciences.

C Contribute to innovation and increased value creation in the ICT industry and in the society at large - covered by 1): having proposed a formalized cooperation with four leading national software-intensive companies (Acando, Husbanken. Nokia/Qt and TelenorIS) whose business profiles complement each other; and 2): dissemination of results in cooperation with the Friprog national competence center for Open Source Software.

D Increase the national competence level in ICT research to internationally leading levels on topics within the programme’s theme – covered by planned continuation of the excellent publication level of the applicants (see CVs) and the current exchange of scientists with leading research groups around the world.

E Establish closer national cooperation between academic research and the ICT industry, and associated experience exchange with society at large – covered as for goal C above.

Compliance with the focus of the last VERDIKT call of June 2009:

1 One of three thematic rows:

- **Social networks:** there is an evolving network of developers, teams and organizations that build and maintain software applications using open source software as described in this proposal. This project will examine how to utilize the potentials for mass collaboration emerging as a consequence of the networked organizations. This approach will generate new knowledge in how social aspects of software maintenance can facilitate innovations in industry by exploiting networked information exchange and social skills. The solutions will improve companies’ ability to develop and maintain better software for the future of the Internet.

2 Two out of four scientific columns:

- **Information management and software technology (not User Interfaces):** covered by the understanding and improvement of methods to maintain\(^3\) conglomerate software systems\(^4\) in an evolving network of providers.

- **Social, economical and cultural challenges and possibilities** are covered by proposing adaptations to important processes in the involved companies, that will lead to more innovative and flexible software development and maintenance, exploring for example “open innovation”, and indirectly to more competitive ICT vendors, and ultimately to more satisfied ICT users.

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\(^3\) By maintenance we mean all changes to a software after its first release, both perfective (revised requirements/ functionality/ performance improvements), adaptive (platform upgrades), corrective (fixing bugs, and preventive (architectural refactoring).

\(^4\) Conglomerate software: composed of software parts from an evolving network of COTS or OSS.
2. Aspects relating to the research project

2.1. Background and status of knowledge

Open source – the new software paradigm: A mobile phone or a car now contains ten millions of source lines, and counting. This is made possible by component-based software development that re-use and integrate common components, being facilitated by the Internet for their shared development, storage, description, semantic search and distribution. Thus, widespread use of a "bazaar" of Internet-provided, third-party software components - mainly Open Source Software (OSS) and partly Commercial-Off-The-shelf Software (COTS) - is changing the whole paradigm of software development. The SourceForge portal alone contains searchable meta-data for over 200,000 “gratis” OSS components, and around 30 domain-specific portals bring the number of available components close to half a million. Over 70% of Norwegian software development organizations in 2006 re-used OSS/COTS components when making new software applications. This means that the resulting (later legacy) systems become heterogeneous conglomerates, containing third-party parts software of highly different origin and licensing conditions. Service Oriented Architectures and Web Services represent less integrated ways to exploit such components, in contrast to more integrated information and enterprise systems.

Software maintenance in general: The majority of published studies of program software maintenance and has predominantly focused on maintenance of application software. Banker et al. define application software as a set of software modules performing a coherent set of tasks in support of a given organizational unit and maintained by single teams. This definition can be expanded to include standardized software products.

Maintenance dimensions: Maintainability is an intrinsic property of software; several factors have a strong influence on software maintenance activities, such as the qualification of maintainers, organizational knowledge management, adequate tools and the interaction with other companies participating of the network of providers. Therefore, maintainability is not solely a system’s property, but touches different dimensions (described below):

1. Technical properties of the system under consideration.
2. Requirements engineering.
3. Collective participation as means for success.

Technical maintenance properties: Programming and documentation guidelines as well as international standards list various possible criteria for the technical dimension of "maintainability". However, the missing adoption of these criteria is due to the following shortcomings of these criteria: 1) too general to be assessed (e.g. modifiability); 2) no sound justification (e.g. methods may not be longer than 30 lines, why?); 3) The system is part of a conglomerate of other components in a distributed environment. There is therefore a need for rigorous empirical studies aiming for improvement of the technical aspects in this new scenario of software maintenance.

Requirements Engineering vs. Maintainability: In addition to technical properties in maintainability, requirements engineering plays an important role in defining “maintainability”, because it determines of how much flexibility should go into which parts of a software system, or for which purpose. For example, the strategy to implement the cheapest possible change without

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5 OSS – Open Source Software: software developed under the licenses of the Open Source Initiative or of the Free Software Foundation, like Linux, Apache, MySQL and PhP (the “LAMP” platform).

6 COTS – Commercial-Off-The-Shelf (software): commercially available and proprietary software, like Windows.

7 http://sourceforge.net


13 Florian Deissenboeck, Stefan Wagner, Markus Pizka, Stefan Teuchert, Jean-Francois Girard: An Activity-Based Quality Model for Maintainability. ICSM 2007: 184-193
any flexibility and restructuring might in fact, yield lower maintenance effort than designing for flexibility in-advance with numerous levels of indirection that might never be needed. In the scenario we are now facing in many companies, this means more cooperation among the companies to find the balance that suits better to all. In addition to the traditional developer/integrator and end-user/customer roles, there is a third-party provider, either an OSS community or a COTS company. The actual software component or product usually offers generic functionality within a specific domain, and is often implemented as a class library. The provider's product is normally offered “as-is” to many integrators, i.e. in a one-to-many relationship. If the offered functionality does not match the required one, we may either renegotiate the requirements or let “someone” adapt the code (if available) with or without payment. Thus, the software integrator is also in an inverse relationship with many providers - a network of providers. This means that the availability of the source code increases the possibilities of doing maintenance.

Collective Software maintenance of OSS: Software maintenance research for conglomerate systems need to shift focus away from studying maintenance only as the individual activity of solving well-defined problems towards the collective activity of constructing “problems settings” out of situations that are puzzling, troubling, and uncertain. Problem setting emphasises the collective nature of software maintenance involving multiple stakeholders with possibly different interests. Focusing upon the contradictory interests brings out the inherently political and social aspects of the software maintenance work. Resolving such conflicts is delegated to, or translated into, an organizational structure with clearly defined roles and responsibilities.

Social networks for OSS innovation: Interaction and innovation hosted by distributed social networks of developers is therefore effectively providing components to the software industries. There are numerous potential benefits in this scenario in terms of standards compliance, quality, cost, and schedule. There is also increased complexity and related challenges in activities like component selection, adaptation, integration, testing, and particularly maintenance. Figure 1 shows a scenario of how companies may interact around components, creating a network that has to deal with the issues of certain components. In the scenario of COTS, the companies do not have to deal with the maintenance of the component directly, although they can influence the directions of the development of such component. In the OSS scenario, many companies are directly involved in the maintenance of the components they are using internally in their projects. The boundary spanning aspects of this scenario implies a level of cooperation and coordination beyond that of the traditional relationships existent among organizations acting as free-agents in the market.

Figure 1 - Network around software components

Organizational partnerships for open innovation: The complex nature of organizational and networked partnerships involved in maintenance of OSS components calls for increased understanding of how specific providers perceive their roles and motivations for establishing cooperative relations in these network clusters. There is therefore a need to investigate the attitude and behavior of the organizations performing software maintenance, and more specifically those considered successful. The success of these organizations seems linked to the concept of open innovation. Such innovation is related to user innovation, cumulative innovation and distributed innovation. “Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology”\textsuperscript{15}. The central idea behind open innovation is that in a world of widely distributed knowledge, companies cannot afford to rely entirely on their own resources, but should instead buy or license processes or inventions (e.g. patents) from other companies. In addition, internal inventions not being used in a firm's business should be taken outside the company (e.g., through licensing, joint ventures, spin-offs)\textsuperscript{16}. The argument is that organizations should open up to their environments, and use both external and internal ideas in their attempts to innovate and advance. However, this requires that the organization is willing to share its own ideas in order to receive from others. This is an exchange that is highly dependent on trust and reciprocity and also to their long and short terms goals. Furthermore, the component provider and related role in software maintenance depends on whether or not the management understands the organization as an isolated actor in a competitive environment protecting its own ideas and products (egoistic approach), or as a player that may profit from interacting with others even though this entails lowering your own protection (altruistic approach).

Summing up the above challenges: Maintenance of software systems involves not only where and how to correctly implement improved functionalities. We must also consider how the chosen technical solutions driven by and interact with a range of human/social issues, like short vs long term perspectives for requirements, organizational power struggles, decision and risk taking under heavy time pressure and with incomplete knowledge, improvisation over unforeseen or unplanned events, or any other “disturbance” in a world of limited rationality. All these effects are amplified by having to relate to and negotiate with an ever-changing network of affected software providers.

2.2. Approaches, hypotheses and choice of method

2.2.1 Overall approach: Integrated improvement and learning in a reflective research model

Our research will be based on the model of the PDCA - plan–do–check–act cycle\textsuperscript{17} - a cycle of activities designed to drive continuous improvement. PDCA is composed of a four-step model for carrying out change. The procedure consists of:

1. Plan. Recognize an opportunity and plan a change.
2. Do. Test the change. Carry out a small-scale study.
3. Study. Review the test, analyze the results and identify what you’ve learned.
4. Act. Take action based on what you learned in the study step: If the change did not work, go through the cycle again with a different plan. If you were successful, incorporate what you learned from the test into wider changes. Use what you learned to plan new improvements, beginning the cycle again.

We intend to have a close participation with the companies involved. Across the research projects in each company, there will be a theory-building and methodology projects concerned with the research challenges and themes described in the next section about the WorkPackages. Based on the


PDCA, we will to follow a reflective model of action research\textsuperscript{18,19,20}, which identifies two main groups of actors: the insiders and the outsiders of the organization. The insiders are the focal point of the action research; they “own” the problem. The outsiders, on the other hand, are the professional researchers who seek to facilitate a co-learning process aimed at solving local problems (see figure 2).

\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{reflective_model.png}
\caption{Reflective model of action research}
\end{figure}

\begin{itemize}
\item \textit{Problem definition.} The problem definition process is the first step in a mutual learning process between insiders and outsiders. A first working definition of the problem under study comes out of a discourse where knowledge held by insiders and outsiders cogenerates a new, mutual understanding through communication with each other.
\item \textit{Communicative action in arenas.} Central to the cogenerative process is its ability to create contexts, or arenas, that allow communicative actions to take place. Examples of such arenas include various forms of meetings, team building sessions, and search conferences.
\item \textit{Mutual reflection and learning.} The initial problem focus suggests a design for an arena for discourse. The subsequent communication produces understandings that help move toward problem solutions, creating new experiences to reflect on for both insiders and professional researchers.
\item \textit{Solving problem through acting.} The struggle to solve important local problems shapes the ground for new understandings, hence the double feedback loops in the figure. Actions taken to solve local problems come as a result of the cogenerative process, through which the participants learn new things about the problems they are facing. The outcome of this collective process of action and reflection support the creation of new, shared understandings.
\item \textit{Learning and reflection.} The feedback loops are similar for both insiders and outsiders, but the interests and effects can be quite different. For insiders, it might be central to improve their action-knowledge capabilities, whereas the outsiders may focus more on producing meaning (through publications) to the research community. Both of these reflective processes are then fed back into the communicative process, shaping the arenas for new dialogues aimed at either redefining the initial problem statement or improving the local problem-solving capacity.
\end{itemize}

2.3. Project plan, project management, organisation and cooperation

2.3.1 Project Plan - Work Packages

Adapting Mäntylä and Lassenius\textsuperscript{21}, we have also identified four viewpoints or general research questions to software maintenance in the context of a network of providers:

1) Affecting Factors: Which factors can explain the current level of maintainability?
2) Evaluation: How can we evaluate software maintainability?
3) Improvement: How can we improve software maintainability?
4) Effect: What difference does maintainability make, (e.g. in terms of development effort?)

Based on the PDCA and the viewpoints described above the scientific work will be done on three levels - social/economic, software process improvement, and software product quality. These three levels correspond to the objectives stated in the electronic application form and will be organized in workpackages named WP1, WP2 and WP3. Management, Dissemination and Exploitation are pragmatically placed together in WP4 and WP5.

WorkPackage 1 (WP1): Collective Participation

**Objectives:** Determine the range of success factors for firm’s willingness to participate in collective network clusters, even though the actors involved may have competitive and conflicting interests.

**Method:** Investigation of empirical cases emphasizing success stories defined by stakeholder within and outside the organization. Applying a theoretical framework as this is defined by the paradigm of open innovation to further our understanding of organizational motivation, attitudes and not the least experience to explain willingness to participate in collective processes for maintenance of OSS components.

**Tasks:** this WP elaborates on the role and motivation of organizational actors participating in collective processes for OSS maintenance, and will focus on types of success factors that may promote such participation. Some relevant issues are:
1. What characterizes behavior and attitudes in those organizations that are considered successful?
2. To what extent may these characteristics be described in terms of degree of openness and exposure to the environment, and willingness to share and contribute to others?
3. What type of experience does these organizational actors rely on, what are the historical antecedents?
4. How do these organizational actors define their role in what comes off as an indeterminable and competitive market?
5. What characterizes those collective processes these actors participate in, e.g. proximity, duration, and types of participants and of collaboration?

**Deliverables:** Lessons learned and results from case studies, guidelines for collective participation, papers about the partial results and one PhD thesis.

WorkPackage 2 (WP2): Process Improvement

**Objectives:** To adapt processes in the companies gradually using the results from WP1, determining which influencing social factors can be used to improve the process of software maintenance in an organization. Also, to determine which social factors influence companies’ incentives/motivations and abilities to cooperate/collaborate with others in a network, and the constraints/opportunities for coping associated with national and international governance.

**Method:** Integration of tacit knowledge from WP 1 into Software Processes using case studies and action research. Data on environmental variation, actors’ responses and what constituted constraints or opportunities on their responses will be gathered through empirical study of selected company. A typology of different social groups and key social variables will be created, along with historical profiles for each group.

**Tasks** in this WP include an identification of how to change software maintenance processes based on how the social effects of variability and change influence the maintenance of software systems in the context of network of providers. Some issues are:
1. How to enhance cooperation/collaboration among companies/providers when performing maintenance using a social network of developers?
2. How shifts in organizational strategies and policies imply changes in organization’s software?
3. How to regard institutions and governance as constraints and opportunities?
4. Which cooperative decision processes and associated experience data may shape the precision of maintenance-relevant advice?
5. What are the drawbacks and advantages of having different processes for maintainability of in-house vs. conglomerate software systems?
6. What are the best practices for moving a software system from one provider to another?
7. What requirements (re) negotiation processes should take place initially, when selecting between available software components (internal, COTS, OSS) vs. starting from scratch? How to manage requirements cooperatively?

**Deliverables:** Lessons learned and results from case studies, guidelines for process improvement in software maintenance, papers about the partial results and one PhD thesis.
WorkPackage 3 (WP3): Product Quality

**Objectives:** To change product quality characteristics using the results from WP1 and 2 gradually, determining which influencing social factors are more hazardous to product characteristics and how it can be used to improve the product for better software maintenance in an organization.

**Method:** Integration of tacit knowledge from WP1 and 2 into development of Software Products using case studies and action research.

**Tasks** in this WP include an identification of how to obtain better software product characteristics based on the social effects of variability and change influence the maintenance of software systems in a context of network of providers. Some issues are:

1. What are the effects of cooperation/collaboration in the software components and the software systems now existing in a company?
2. How to measure maintainability of conglomerate software systems in a network of providers? Which aspects of the source code indicate better or worse maintainability of such systems (ex. defect and change rates)?
3. If we have all these companies/partners “changing” the components, what could be the impact on the structural complexity of the whole system?
4. Are different release periods of OSS/COTS software disruptive?
5. How to learn “openly” from own and others experience to support risk and knowledge management in the above issues?
6. How to benefit of the network of developers to improve product quality?

**Deliverables:** Lessons learned and results from case studies, guidelines for product quality improvement, papers about the partial results and one PhD thesis.

WorkPackage 4 (WP4): Management

**Objectives:** To provide an orderly project execution, with intended external effects.

**Method:** Competent managerial leadership and attention to diverse publication and teaching channels. Professor Reidar Conradi, PhD, will be the project manager. Conradi has long experience from national and international research project both in Europe and the US. The members of this project have worked in joint improvement projects with industry for over 15 years resulting in over 200 scientific publications and 20 PhDs. Our starting point is strong, both regarding research methods and industrial networks.

**Tasks:** For this plan we need:

- A lasting (longitudinal) and trustful cooperation between OSS/COTS researchers and practitioners in mature software-intensive organizations (the proposed Inner Ring companies) to produce innovative and valid results. These companies have agreed to work with us in the proposed project; and they are well known to us from previous projects at NTNU Samfunnsforskning (www.samforsk.no/apertura) and IDI (www.idi.ntnu.no/grupper/su/). Many of the researchers and industrial contacts have thus participated in joint R&D projects over the last decades, so the basic “chemistry” is good. There is also a good understanding of the success factors around technology transfer and innovation.
- A social science and organizational perspective is needed to understand the social and process aspects of coordination and collaboration between a multitude of actors, here counting providers, managers and developers. This perspective is essential for understanding the organizational interstices between these different providers and their business clients.
- This means that an interdisciplinary research approach will be adopted. A mix of qualitative and quantitative research methods will be applied, including interpretive case/field studies and action research, where the researchers work close to the developers. A special method curriculum will be defined and taught especially for the project’s PhD students.

**Deliverables:** Integration of results from WP1, WP2 and WP3, workshops with companies and senior scientist members, budget administration, status report to NFR and personnel administration.
WorkPackage 5 (WP5): Dissemination and Exploitation

**Objectives:** To provide an orderly dissemination of the results from this research project.

**Method:** Attention to diverse publication and teaching channels.

**Tasks:** See Dissemination Plan at the *Grant Application Form*.

**Deliverables:** Guidelines, papers about the results, PhD theses and course materials.

### 2.3.2 Project organization

The project will be organized as illustrated in Figure 3. The kernel team consists of two senior faculty members (Conradi and Schiefloe), one senior researcher (Osmundsen), and two postdocs (Cruzes and Søyland) and three PhD students from IDI-NTNU and NTNU Samfunnsforskning. The SEG (Software Engineering Group) at the IDI department is the executing applicant, and has 160 employees and 25 at SEG, including 6 professors. The SEG has produced 26 PhDs, 900 reviewed papers since 1990, and has been involved in over 40 R&D projects where most had industrial co-workers. NTNU Samfunnsforskning was formally established in 2004, has over 150 employees in nine departments and is working closely with the social science Faculty at NTNU.

![Figure 3 - MAIN-SOFT Project partners organization.](image)

We have negotiated commitments from four software-intensive companies to form an “Inner Ring” community of OSS-practicing organizations – our *test bed*. Figure 4 shows a high level view about how these companies are connected to each other in forming a network. A profile of these companies is described in Table 1. All the case studies in this project will be held in these companies in the projects they are currently maintaining.

![Figure 4 - Network of Providers at Main-Soft](image)

Moreover, we will build upon and strengthen our International and National network of researchers. The *outer ring* is composed by leading international research communities which we have a strong collaboration with from international research projects and co-authoring more than 20 scientific publications (See *Grant Application Form*). We will arrange four internal workshops and one public seminar, co-located with one of the workshops. We also count on the participants of the Nordic OSS Researchers Network founded by NordForsk (2009-2013), in which we are members.
After project start, we will establish an advisory committee consisting of Conradi and Osmundsen, and representatives from Inner and Outer Ring partners. This committee will meet yearly (at the planned workshops) to discuss the most important issues like focus, publication plans, methods and ethical issues related to the research.

Table 1 - Companies Profile

<table>
<thead>
<tr>
<th>Organization</th>
<th>Domain</th>
<th>Quick Facts</th>
<th>#Dev</th>
<th>Dev. Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husbanken</td>
<td>Financial Services</td>
<td>A modernization and extension of its 10 information systems has started, involving more net-based services and a transition to Java from the Natural/Adabas-platform of 1986, and use of OSS. The systems are used internally in the Housing Bank and has functionality for application / processing, payment and management of loans / grants. The systems has integration with other Web-based services / systems. Housing Bank plans in 2010 to run a pilot project to see the renewal of Greetings.</td>
<td>37</td>
<td>Natural and Java</td>
</tr>
<tr>
<td>Nokia Qt Development</td>
<td>Telecom, Linux and Graphical Software</td>
<td>Qt is a leading framework for software development on mobile phones, personal computers and embedded systems in all industries. Qt is cross-platform and runs on Linux, Mac, Windows, Linux embedded, Symbian and Windows CE. Thousands of manufacturers are using Qt for consumer electronics, office applications, automation, transportation and many other areas. Qt forms the basis for tens of thousands of commercial and open source application. There are more than 15 million Qt-based Linux devices on the market currently.</td>
<td>100</td>
<td>C++, Java</td>
</tr>
<tr>
<td>Acando Solutions</td>
<td>Health, Government Telecom, Financial Services</td>
<td>Acando has a very strong position in the public sector, including health and central government and just delivered a new national case management solution for reimbursement of travel expenses. The project team is PA 12 people including subcontractors (Sun, Avella, Redpill-Linpro) Used many OSS components aiming for opportunities for reuse of the platform</td>
<td>100</td>
<td>Java and WebServices also MySql</td>
</tr>
<tr>
<td>Telenor IS</td>
<td>Telecom</td>
<td>Telenor IS is responsible for 400 information systems serving Telenor Norway. Telenor IS has an internal initiative since 2008 to gradually replace in-house and COTS based systems with OSS, in order to save internal resources and license fees and to avoid &quot;lock-in&quot; to certain solutions or providers. NTNU helped to carry out a survey on Telenor employee’s attitudes to OSS in spring of 2009, showing a very positive reception.</td>
<td>760</td>
<td>Java, Oracle, Sybase, Oracle Siebel CRM, and Spring framework.</td>
</tr>
<tr>
<td>FriProg</td>
<td>Government</td>
<td>Friprogsenteret is an independent, government-funded Center for free software, and assists or develop free software in IT solutions. The goal is to establish a culture of sharing, reuse and collaboration of IT solutions and digital inn hold. Friprogsenteret offer venues for sharing, build professional networks and distributes information through lectures, web services and Friprogmagasinet.</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

3. Perspectives and compliance with strategic documents

3.1. Compliance with strategic documents

NTNU and IDI have just started working on a (new) strategic plan for research. However, the software engineering group internal research plan from 2007 identifies "open source software" in general as a prioritized topic, and 50 papers since 2003 deals with this phenomenon. The project will also be highly relevant and contribute to the existent research at NTNU Samfunnsforskning, and Studio Apertura department. For the past 10 years, Studio Apertura has worked on numerous projects in the multidisciplinary area of social science, organization studies and technology use. The department will in this project both draw on its existing knowledge and experience, and be able to advance its research in an upcoming field;

3.2. Relevance to the society

The importance of ICT and software in general: Our societies’ reliance on well-functioning ICT in general, and software in particular, is paramount. The Norwegian industrial ICT sector had in 2007, 78 000 employees, 214 bill, 76 BNOK in value creation (3% of the total), and consumed 40% of industrial R&D. It is therefore Norway’s second largest industry next after petroleum. It is also crucially important for innovation, value creation and staying competitive in the rest of society, especially considering the needs to “modernize” the public sector in a slow-growing economy. According to a SSB report, there is a 24% increase in productivity for corporations that use ICT to a large extent, compared with those that don’t.

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22 Statistics Norway (SSB), http://www.ssb.no/emner/10/03/ikt/ (look for 2007 data).
OSS Importance: The research on OSS is underlined by the increased importance of OSS components in Norwegian private and public businesses. Also the Norwegian Government state that public agencies are recommended to use solutions based on OSS (Norwegian “Regjeringa ønsker at offentlege verksemder i større grad tek i bruk løysingar baserte på open kjeldekode”) to increase competence development in the society (IKTmeldingen 2007). As mentioned, the European Union is playing an important role in the promotion of research and dissemination of OSS in Europe. Research projects and research networks in the area have been funded (FP6 IP QualiPSo, European ITEA COSI, and resulted in already finished projects such as CALIBRE and COSPA).

3.3. Ethical aspects

Our experience with SE and research projects at NTNU involves researchers, sponsors, industrial partners, and students. This makes us aware that there are important ethical challenges to address as researchers, sponsors, and our subjects can be involved in ethical problems.

- Our research project will employ human subjects and will involve the collection of information that can lead to identification of individuals. Such identifiable information can be collected through observation of humans or examination of artefacts. One of the most important ethical principle is that of full informed consent on the part of the subject to participate in the research project. As mentioned in the previous section, given the global and distributed nature of OSS projects and given the volunteer dimension in this kind of projects it is particularly challenging to address the principle of informed consent during research planning and management.

- Confidentiality of information that can harm the involved companies. If for example, flaws are found in the product and process models of one organization, these cannot be revealed without taking into consideration (in cooperation with the involved companies) the consequences that possible revelations can have for the company.

- Ethical issues in empirical studies can also be related to the use of subjects in investigations but there are guidelines on how to avoid pitfalls, and related documents and standards (ex. IEEE-CS/ACM Software Engineering Code of Ethics and Professional Practice).

3.5. Gender equality and gender perspectives

This research project takes an integrated approach to gender equality. There will be a female postdoc working in this project – Daniela Cruzes, and one of the senior researcher on the project is female, Tonje Osmundsen. In other countries there is a large percentage of women working in the area compared to Norway so this project has a goal for involving more women in research lead positions. This project will have a proactive attitude towards female recruitment, in cooperation with initiatives like “Women in Computing” at NTNU. We have 2 other female professors in the group at IDI with research interests in this project (Prof. Divitini and Prof. Jaccheri). Prof Jaccheri is also a member of the thematic ESTIA-Net, a programme of the European Commission/Directorate General for Education & Culture/Higher Education.

4. Communication with users

Networking, experience, and knowledge sharing activities will be based on meetings and technical visits with the collaborating companies, also with shared supervision of master and PhD students at NTNU. The user groups in MAIN-SOFT are software engineers who develop and maintain software in their work. For the validation of our goals we plan to have a close cooperation with especially our partners members, and with other Norwegian companies. We plan to organize 4 annual workshops and to invite our International and National contacts including and Nordic OSS Researchers Network contacts, starting from 2010. Through the ITEA project COSI, we have developed a list of 250 ICT companies that actively use and or produce OSS.

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